ARI Research Note 87-15

NATIONAL TRAINING CENTER LESSONS LEARNED: DATA REQUIREMENTS

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The Army Research Institute and the Combined Arms Training Activity (CATA) held the first of a planned series of working group meetings to improve National Training Center (NTC) data on May 13 and 14, 1986. This research note summarizes the results of that meeting, and lists previously identified user needs as well.

A comparison of user needs to the data currently collected shows that the data are insufficient to answer many important research questions, and the note concludes with recommendations for improving data collection techniques, quality, and types.

NATIONAL TRAINING CENTER LESSONS LEARNED: DATA REQUIREMENTS

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Introduction

The National Training Center (NTC) was established in accordance with Army Regulation (AR) 350-50 which defines NTC missions and responsibilities. The objectives of the NTC are to:

- Provide a facility where heavy battalion task forces, controlling brigade headquarters, and supporting units can undergo essential combined arms training that cannot be accomplished at home stations due to physical limitations and prohibitive cost of providing a realistic training environment.

- Gather information to help improve doctrine, tactics, training system, equipment and procedures. This information also assists the Army in relating resources to readiness.

These purposes were reiterated in the Chief of Staff's NTC Policy Statement in September, 1984, in which he emphasized the need and the challenge to continue the tough, successful training for Battalion Task Forces, while finding ways to expand NTC's capabilities to promote innovation. One way to meet this challenge, he stated, was to "develop the NTC range instrumentation and associated long-range plans to permit detailed analysis and feedback. . . . We must all work together to harness the NTC's full potential and spread the NTC experience throughout the total Army."

The NTC has been extremely successful in meeting its training goals. Units have been exposed to the most realistic, intense training environment ever developed. Faced with a highly trained and motivated opposing force (OPFOR), continuous training, and highly dedicated observer/controllers (OCs), the training experience which units receive is unparalleled.

The development of Lessons Learned has been a slower process. According to AR 350-50, "The training environment will be paramount at the NTC." Primary emphasis has, therefore, been placed on the training mission of the NTC. In August, 1985, the Center for Army Lessons Learned (CALL) was established within the Combined Arms Training Activity (CATA). CALL's mission is to provide combat relevant Lessons Learned to the total Army. The Army Research Institute (ARI) has a letter of agreement with CATA which includes tasks directly relevant to this mission. Specifically, ARI has agreed to:

- Develop methodology for the use of NTC findings in doctrine, organization, equipment, and training development.

- Develop methods to improve the utility and quality of NTC data.

On May 13-14, 1986, the first meeting of a planned series of working groups to improve the quality and utility of NTC data was held at ARI, Presidio of Monterey. This report summarizes the results of that meeting. In addition, this report includes a compilation of users' needs of NTC data which have been gathered over a period of several years. The current status of the NTC data collection system is described and its capability is compared to users' needs. Requirements for meeting discrepancies are outlined and recommendations for improving the data collection system are made.

User Needs

Definition of User

The agencies or groups interested in utilizing NTC data sources fall into two categories. There are primary users of the raw data who have the capability of analyzing that data and putting it into a format which secondary users can interpret and utilize for decision making.

Among the primary users are CATA, the research community (e.g., ARI, Arroyo Center), and the modeling and gaming community (e.g., TRADOC Analysis Center). The analysts at the NTC are also primary users who use the data for their After Action Reviews (AARs) and Take Home Packages (THPs).

The primary users put the data into a format which is usable by others. These include the schools, computer assisted battle simulations, trainers at home station, and policy makers at Department of the Army, Forces Command, Army Materiel Command, and Training and Doctrine Command.

Initial Working Group Meeting

Purpose. With the establishment of the Lessons Learned program, the applications of NTC data and the number of agencies and individuals involved in data collection and analysis have increased. Each agency has a partial view of the data collection and processing system. ARI initiated the establishment of a working group to, first, share information on current activities and problems or questions. This exchange of information was intended to provide a common broad-base description of issues.

The second purpose was to develop recommendations for near-term and longer-term approaches to improving the quality and quantity of information from the NTC. With these goals in mind, CATA invited the participants to attend the May 13-14, 1986, meeting held by ARI, at its Presidio of Monterey Field Unit. Appendix A gives an overview of ARI's NTC Research Program, as briefed at this meeting. ARI has resources in all of its' three laboratories working on NTC-related projects and a number of research products have been and are being developed.

Participants. The following agencies were represented at the meeting (see Appendix B for list of individuals in attendance):

- Combined Army Training Activity
- TRADOC Analysis Center
- AMEX Corporation
- Army Training Support Center
- Arroyo Center
- Army Training Board
- Combat Development Experimentation Command
- United States Army Infantry Center
- The BDM Corporation

Identification of Needs

After a series of briefings (which are integrated into this report and included as appendixes), the working group generated a list of data of interest to them. This list was divided into near and longer term based on the difficulty of obtaining the data. The near-term data were prioritized into three categories, based on the value of the information and the amount of work required for NTC personnel to collect and provide it. Near-term, high priority data needs are included in the Recommendations section of this report. Longer-term or lower-priority needs are at Appendix C.

This meeting was the most recent of many efforts to collect similar information. In 1982, the Combined Arms Center (CAC) solicited input on requirements for an NTC Data Base Library. Most of the responses gave detailed lists of the type of data various agencies would be interested in. Responses are at Appendix D.

The information at Appendix D was distilled by CAC through an NTC Combat Mission Analysis. They developed 1500 questions to be answered for each unit (see Appendix E).

In 1985, an NTC Firing Data Workshop was held to examine needs which could be met with NTC data. Notes on this workshop are at Appendix F. ARI's resident contractor at the Presidio of Monterey Field Unit, BDM, also generated a list of potential research issues which might be addressed. These are categorized by Operating System and are at Appendix G.

In November, 1985, CATA hosted a NTC Lessons Learned Workshop to extract and disseminate lessons learned and increase awareness regarding the agencies available to collect data, how they collect it, and what they produce. The roster of those in attendance is at Appendix H. Most recently, the NTC was used to collect data for testimony to Congress on the Bradley Fighting Vehicle. The type of data which was collected and which would also be of value for other training applications is at Appendix I.

A review of these appendixes makes it clear that there are a magnitude of potential uses of NTC data. The following examples of questions which could potentially be answered in each of the categories specified in AR 350-50 demonstrate the breadth of relevant issues.

Doctrine.

- What problems are presented by the J-series table of organization and equipment (TO&E), particularly with dismounted infantry?
- Where should Command Groups be positioned on the battlefield?
- How effective is air defense early warning doctrine?
- Does current doctrine adequately show units how to attack Soviet strongpoint-type defense?

Tactics.

- What is the contribution of Infantry anti-tank weapon systems to the close-in anti-armor battle?
- To what extent is combat power concentrated in conducting a deliberate attack?
- How can mortars be effectively utilized in battle?
- Was the amount of terrain offering cover and concealment considered?

Training system.

- How can the effectiveness of tank and tube-launched, optically-tracked, wire-guided missile system (TOW) crews be improved?
- To what extent do inaccurate calls for fire cause direct fire fratricides?
- To what extent do task forces employ counterattacks in the defense?
- Do engineers employ minefield equipment and techniques effectively in obstacle construction?

Equipment.

- How does the Bradley Fighting vehicle compare in performance to the M-113?
- Are current battalion communications equipment packages capable of surviving on the battlefield?
- What was the average down time for radios turned in for maintenance?
- What is the contribution of VIPER and DRAGON to the anti-armor fight?

Procedures.

- How effective are cross-attached companies as compared to pure companies?
- How can the fire support officer (FSO) best synchronize fires?
- What is the most effective procedure for passing early warning information?
- Do units react in accordance with the mission-oriented protection posture (MOPP) level designated by the commander?

Many of these issues could potentially be answered with instrumented data, e.g., position location and firing data. Others would require observational data or information from the communication nets. It is, therefore, important to look at the current data collection system to determine its capability.

Current System

There are three primary sources of NTC data available to potential users: the instrumentation system, Take Home Packages (THPs), and 40-channel communication tapes recorded during rotations. Policies and procedures at the NTC are in a continual state of evolution, so this report will discuss the capability of the current system, as known. Each of the three sources of NTC data will be described and discussed. The actual use of the instrumentation system differs from its design and potential utility, so these two topics will be discussed separately.

Instrumentation System

Appendix J contains the briefing materials presented at the initial working group meeting by AMEX, Inc., the developers of the instrumentation system. Two subsystems are principally involved in the digital data collection. The Range Data Measurement System (RDMS) collects raw field data. Much of this data is transmitted to the Core Instrumentation Subsystem (CIS), where data can also be input manually.

RDMS data. The RDMS collects data on trigger pull (fire event), laser illumination (pairing), microphone key pressing, and the raw data from which position/location is derived for instrumented players. During Live Fire Exercises, data on target status (up, down, hit) is also collected. The capacity of the system is limited so there are a large number of uninstrumented players for which position and event data cannot be collected. In addition, none of the dismounted personnel are instrumented. For example, in a sample of ten defensive missions, an average of 27% of the players were not instrumented. The percent uninstrumented ranged from a low of 17% to a high of 38%.

According to Briscoe (1986):

> RDMS data are as accurate as the reliability of the collecting/transmitting hardware allows. The complexity of NTC field instrumentation is conducive to a wide variety of error-producing conditions, including:
>
> (1) Spurious radio frequency (RF) transmissions, leading to erroneous events;
>
> (2) "Noisy" laser sensors which generate spurious and/or inaccurate pairing events;
>
> (3) Hardware/electronic player instrumentation problems leading to loss or duplication of valid events, and the generation of invalid events; and
>
> (4) Coverage problems resulting in the loss of track of instrumented vehicles and the corresponding loss of position/location and event retrieval capability.

Even in the case of perfect hardware performance, it is possible for errors to be introduced by faulty initialization. If the proper B-unit code is not associated with the right player identification, incoming events will be improperly assigned or may be deleted as invalid. Such problems can quickly lead to a serious loss of data integrity.

MILES. The force-on-force exercises use laser-based, engagement simulation technology. MILES (Multiple Integrated Laser Engagement System) is used on all principal weapons and results are assessed when a weapon fires and the MILES laser hits a target. While this system provides a high degree of realism to combat training, it is not without some deficiencies. For example, the laser does not penetrate smoke and a target which may be sighted with a thermal sight could not be "killed" with MILES.

Another problem is that in order for a TOW to kill a target, it has to track the target for 15 seconds. This effectively simulates the requirements for targets at long ranges, but not short ranges. Therefore, a TOW which tracked a target for less than 15 seconds at short range would not be counted as a kill, even though in actual combat the length of time may have been sufficient. MILES also does not compensate for differences in requirements to range to target or to employ a lead angle by actual weapon systems. The laser technology instantaneously hits the target whereas actual ammunition would take some period of time.

CIS data. The CIS logs data in real-time to provide the primary archival source of NTC data. It also supports pre-exercise initialization in which player information, control measures, task force organization, live fire scenarios, and pre-planned artillery is entered. The CIS also pairs firers with targets and calculates statistical measures.

According to Briscoe (1986):

> It should be noted that many of the elements logged from the CIS are manually input data elements. Reliability of manual data depends upon the accuracy of the personnel entering the data and the verification procedures that are employed, such as proofreading and consistency checks.

Digitized history database development. Appendix K shows the list of statistical displays that the software is capable of supporting. Fobes (1984) and Science Applications, Inc. documentation give detailed descriptions of each of these displays. These data are displayed for a mission on a VT125 Graphics Monitor when a specific history tape is loaded. This means that data in these tables can only be collected on a mission by mission basis. The primary users of these displays are the analysts who prepare the AARs.

Science Applications, Inc. developed software for ARI intended to translate the display data into a format which would facilitate analysis with INGRES, a relational data base management system. Sixty-one INGRES tables are created for each translated history segment from an NTC rotation. A description of each of these tables is at Appendix L.

Instrumented database status. Software development to translate mission data into INGRES tables is still on-going. Among the remaining problems, for example, are the following. Position/location data are critical to most

research questions. However, the software takes a tremendous amount of time (approximately one hour of position/location data takes an hour of computer processing time) to process these data, so until new software is developed to more efficiently handle the data, translation of position/location data will be limited. Also, the current process creates an INGRES database for each mission segment. Research clearly requires being able to aggregate data across missions, but this is not easily done. The current database is "inconvenient to use, is massively redundant, and contains superfluous data" (Briscoe, 1986).

In addition, there is a great deal of missing data which are of potential research value. On a sample of 71 missions, the number of empty tables ranged from 13 to 44 of the 61 tables. Only an average of 35-36 tables contained any data. Even those that contain data may be incomplete. For example, the table SEGSUMRATING is supposed to contain segment summary ratings provided by key training operations group personnel (i.e., TAFO, EMCO, and Chief OC) at the end of the segment. The collective judgement of this group on the performance of the battalion is expressed in numbers from 0-9, using the following scheme: 0 = no observation; 1 = very poor; 3 = poor performance; 5 = nominal expected performance; 7 = good performance; and 9 = excellent performance. These ratings are to be made on Overall Exercise Effectiveness; Target Acquisition; Maneuver; Fire; Communication; Command and Control, and Logistics and Administration. These data, although subjective, have potential research value. However, this table contains only the date and time the mission ended. All ratings are missing in the sample of missions which were examined.

There are two sources of data for the tables: the field instrumentation system and operator-entered inputs. The tables which require manually entered data are empty or sparse. Thirty-three of the 61 tables require some or all data to be manually entered. It is clear, therefore, that the current system could support the collection of a great deal more data than is currently gathered. The utility of the data which is currently being archived is only marginally useful for research on NTC performance, but the capability obviously exists for significant improvement.

One problem which has impeded the database development process is a lack of documentation of the SAI software. It would be advantageous, for example, to have the format of the CIS logs. Without documentation, it is impossible to know if the CIS tape contains everything on the RDMS tape.

ARI has recently developed software that allows for reading the RDMS log tapes. The RDMS might contain additional information of importance for off-line analyses, e.g., the MILES code for the firing weapon for each vehicle which has been killed. This information might also be on the CIS tape, but this has not yet been determined. The consistency between the CIS log and the RDMS log is currently being examined. It may be possible to extract additional relevant information from the RDMS tapes for research purposes. Appendix M contains working group briefing slides on the status of the digital data analysis and data base development.

Take Home Packages

Appendix N contains briefing slides from the initial working group meeting which describe an analysis of the Maneuver Performance Trends section of 26 THPs from 1984 and 1985. The THPs potentially serve two purposes: to guide home station training and for development of Lessons Learned across battalions.

The results of this analysis indicate that because the format of the THPs is not related to the ARTEP, it may be difficult to translate the Performance Trends into training guidance for home station. Due to the lack of consistency within and among OC training teams regarding what they observe, the data is also of little value for deriving Lessons Learned. Some trends were identified, but of the 113 issues, relatively few were commented upon consistently enough to draw conclusions.

The battalion THPs also contain After Action Review (AAR) summaries for each mission. These data were not analyzed and are potentially of value. Appendix O contains briefing slides describing an analysis of this section of the company THPs for leadership Lessons Learned. Again, a great deal of variation was found in the amount, quality, and format of information. The key to THP data being of any value for Lessons Learned is standardization of observations.

Communication Tapes

A recent analysis of the research potential of the 40-channel communication tapes found that the tapes are a rich source of detail and essential contextual information (see Appendix P). They can be synchronized with the workstation display of the battle which greatly increases understanding of what is taking place. The OC control nets probably provide the best source of data.

The major problem with using the tapes for research purposes is that it is, currently, a very labor-intensive process considering that, with 40 communication channels, one rotation is the equivalent of 1280 days of recordings. In addition, there is a problem with override of channels. Electronic methods of processing the information would not be able to determine whether a transmission was a legitimate one or if it was coming through from another net.

There is a large discrepancy between the number of transmissions actually counted in listening to the tapes and the number of transmissions reported in the THPs. The THPs appear to report far fewer transmissions than were found on the tapes. This makes the THP communication data misleading and essentially worthless. This disparity needs to be eliminated.

Data Availability

Appendix Q contains the briefing material describing current and planned NTC data acquisition and storage. ARI currently has digital tapes from August, 1983 to the present; most of the THPs from January, 1982 to January,

1986; some operation plans; and a few AAR video tapes and unit After Action Reports.

Coordination has recently been accomplished with the NTC Operations Group to ensure routine acquisition of materials, including communication tapes, exercise control logs, and operation orders by ARI. This clearly will result in a requirement for storage space. To reduce this requirement, consideration is being given to transmitting the THPs on floppy disks and to compressing the communication tapes.

Discrepancy Between User Needs and Current System

The existence and the magnitude of potential uses of data for Lessons Learned from the NTC was clearly demonstrated in the initial working group meeting, as well as by Appendixes C through I of this report. The questions raised by these sources cannot be answered with the data currently archived. The reasons the data are insufficient to answer such questions include:

- The lack of standardization regarding observations made/recorded by the OCs. Standardization allows quantification of information and statistical manipulation and permits interpretation of results.

- The large amount of data which must be manually entered which is missing. Much of these data would be valuable for research and analysis.

- Limitations on the number of players which can be instrumented. The current system supports 500 instrumented players. In reality, usually only 400 to 425 players are actually instrumented. This total must include not only battalion task forces, but OPFOR, OCs, and brigade players, so some percentage of players are not instrumented and, therefore, not tracked. To the extent that there is any systematic rationale behind decisions on who to instrument, such as the fact that no dismounted personnel are ever instrumented, the data which are collected may not be representative. There is currently a Statement of Work for a contract to increase the system to 1000 players.

- Coverage problems. Even if a vehicle is instrumented, the terrain at the NTC can mask it so that its current position/location cannot be tracked. This, again, results in missing data. If the missing data were random, it might not be a major problem. However, if, for example, there was a research question regarding the performance of tanks in the defense and the better performing tanks were more effectively hidden, any data collected on the less-well-hidden tanks would not be representative. In a sample of ten defensive missions, for example, there were a total of 327 instrumented tanks. Of these, 12 percent were never tracked and an additional 6 percent were only partially tracked.

- Electronic hardware problems leading to spurious, inaccurate, or duplication of events.

- The fact that a research data base does not exist. The current structure of the software requires that data be accessed mission by mission rather than across missions. Within the next six months to one year, the data base will be redesigned. In addition, only a small part of the information required for analysis and interpretation is in digital form. Merging of data from multiple sources is manpower and time intensive.

The above issues differ in terms of the degree to which they can be resolved. The next section of this report discusses requirements for improving the quality of data from the NTC to support the development of Lessons Learned.

Requirements

Procedural

The achievement of inter-rater reliability among the OCs is critical for development of Lessons Learned. This is an evolving process and needs to involve training programs. The system which is now in place was designed for training and has been very effective for that purpose. However, a system which will support both training and generation of Lessons Learned is necessary. Appendix R contains briefing materials on OC procedures. It is clear that the OCs are extremely busy. OCs are very competent and dedicated, but they need tools to assist them in making systematic observations, so that they can "work smarter, not harder." ARI has begun to assist in this process within the CIS. Training materials and SOPs have been and are being developed for their use (see Appendix S).

It is clearly necessary to determine which aspects of performance need to be systematically observed and measured. Careful analysis is needed which will consider priorities for information, as well as what is desirable. The ground rules regarding what needs to be observed have to be standardized and OCs need to be re-calibrated after they have been in the field for a while. ARI is currently working to design and develop a system for measuring and interpreting the effectiveness of unit performance at the NTC. As part of this effort, an NTC-specific ARTEP and NTC observer guides are being developed. Briefing materials describing this effort are at Appendix T.

Hardware

One tool which would be of great utility to the OCs is the Electronic Clipboard. Briefing materials on this are at Appendix U. This piece of equipment would allow for downloading of performance observation guides into the hand-held clipboard. Data on performance would be input into the clipboard by the OCs in the field. The digital data in the clipboard could then be radioed to the CIS or uploaded by an RS232 connector directly into the

CIS. This innovation will increase the reliability of observations by providing standard observer guidance cues and automation for the recording and processing of performance ratings. This will assist the OCs in doing their jobs rather than adding to their responsibilities, and provide improved information for AARs and THPs, and the research data base.

The Electronic Clipboard is also one of the components of the Integrated Training Management System which is being developed in the 9th Infantry Division. This division-level system is being developed to improve the ability of units to prioritize, resource, conduct, and evaluate training through management automation. It takes into account training priorities set by leaders; prerequisite relationships among individual and collective tasks; availability of resources; and unit training needs. A prototype system has already been developed by ARI and successfully tested in a field artillery battalion of the 9 ID (MTZ). This system has great potential for integrating NTC experiences with home station training.

Related to this is a planned ARI contract on the determinants of effective performance at the NTC. The purpose of this research will be to improve unit training through better integration between NTC and home station and to determine what unit training management practices, organizational processes, leadership behavior, and individual abilities have an impact on performance at the NTC. Briefing materials describing this effort are at Appendix V.

Software

As previously noted, there is currently a Statement of Work which solicits proposals to upgrade the current NTC software. Appendix W contains briefing slides and a memorandum on a meeting to validate the requirements of this Statement of Work.

The upgraded system will be able to track 1000 players instead of 500. It will incorporate new nucler, biological, chemical (NBC) control measures. Air Defense, Helicopters, and Air Force jet aircraft will be instrumented with MILES and will be able to be tracked and displayed. It will automatically collect tactical fire direction system (TACFIRE) messages and have increased fire mission storage.

A major improvement is the ability to assign each player an identification code. Currently, pairings are established by time coincidence and player identifications are made based on position at the time a firing event occurs. The new system provides identification of the firing vehicle and weapon fire for each MILES hit/near miss/kill event. It will provide graphical display of individual weapons systems/player unit and hit/near miss/kill data. Obtaining player and crew identification was identified by the working group as a medium priority, near-term data collection need. It would appear that this solicitation will supply this information.

The SOW also provides delivery of the NTC workstations to home station units. This will give units the capability to replay NTC exercises. An upgrade of the video and audio capabilities is also provided for. These improvements are to be implemented incrementally, but should be completed two years from award of contract.

Recommendations

The recommendations in this section were developed from the working group meeting held in May, 1986. The most immediate requirement is that ARI be provided detailed information on current procedures used at the NTC. The training environment at the NTC is in a state of constant evolution. ARI will have a researcher in residence at the NTC in July, 1986, which will facilitate tracking of procedures.

It is also important that a concerted effort be made to get information from units regarding their needs in the AARs and THPs. This will allow a better integration of training and Lessons Learned needs. It would be of value to know if and how units use the information provided to them and what additional data would be of interest. This research effort is now in the planning stage by ARI.

It is important to ensure that the NTC retains the tapes of the 40-channel communication networks recorded for each rotation. The cost of the tapes has led to reusing them after approximately six months. One of the briefings in the working group meeting described an evaluation of the research potential of the tapes and recommended that they be retained. The consensus of the group was that the cost of the tapes within the context of the seven million dollar cost of the rotation was relatively minor. Recent coordination with the NTC has supported this action.

There is currently information being collected at the NTC which is not being provided to ARI. Evidently, information on indirect fire currently exists in a paper form, but is not retained after a rotation. Also, division, brigade, battalion, and OPFOR operations orders and graphics for each mission exist, but are not collected or retained. Army Material Systems Analysis Agency (AMSAA) currently collects data on Combat Service Support and operational readiness to provide Lessons Learned to the Materiel Readiness Support Agency. This data should be relatively easy to obtain to assess its utility for other analyses.

The current software has the capacity to collect free format messages with a maximum length of three lines of text of 80 characters per line. If the OCs in the field would have the CIS analysts routinely enter information with important research potential, it would be a relatively simple method of collecting data for Lessons Learned. Of high priority to the working group was to use this capability to collect information on the number or percent of friendly and enemy kills, by weapon system, after every battle. The OCs know this information, but it is not collected in a systematic fashion and was of great interest to all of the meeting participants.

Also of high priority for collection with the free format message capability was entering and time tagging verbal fragmentary orders (FRAGOs) during the battle. Also of interest, were free format messages on:

- smoke conditions and major weather changes;
- dismounted infantry positions and casualties held some interest but were regarded as a difficult data collection burden for the OCs;

- start and end times of the battle would be useful;
- the reasons for OC kills and resurrections are very important.

This method could also be used to collect information on informal, spontaneous organizations that emerge on the battlefield. However, this was of bottom priority for the group. It is important to emphasize that if procedures are implemented to collect any or all of this data that it must be done in a consistent fashion. Partial or inconsistent use of free format messages would make the data uninterpretable.

Another useful set of data which could be supported by the current software is the header data for each mission. This defines the scenario number; intensity of fire support, artillery, and mortars; available planning time; nuclear, biological, and smoke conditions; engineer, air defense, and electronic warfare activities for both friendly and opposing forces. It also tells visibility conditions and the number of times the unit has been through the scenario. This data must be manually entered by the CIS analyst and is not usually done. The working group determined that these data would be of value, but the group was concerned about increasing the workload of the CIS analysts.

Conclusions

The issue of the value of data for Lessons Learned and a recognition of the shortage of personnel and current workload of OCs and CIS analysts was a recurring theme in the working group meeting. Only a limited amount of information can be collected through instrumentation. Much of the data of value for Lessons Learned requires systematic observations collected in a consistent manner. The current software would support much of this data collection, but it would be expensive in terms of personnel time. It was the consensus of the working group that additional requirements could not be generated without additional resources being supplied. For example, additional personnel were assigned to collect data on the effectiveness of the Bradley Fighting Vehicle. The Electronic Clipboard will be another valuable training evaluation and research data gathering tool.

Army decision makers need to balance the potential utility of the National Training Center for improving doctrine, tactics, training ~~systems,~~ equipment, and procedures against competing requirements for personnel resources throughout the Army. The potential of the NTC for Lessons Learned has not been realized. CATA, ARI and other primary users of the data for Lessons Learned have utilized the available data as effectively as possible. However, they recognize, and have described in this report, how much more could potentially be achieved if additional resources were available.

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